

**EXHIBIT 16**  
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**Cheng Uei Precision Industry  
Co., Ltd.**

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**Subject:**

**Raptor V2 3.5 USB3.0 Thermal Limit Test Report**

**Customer: Seagate**

**Product: Generic Hard Drive Assembly Unit**

**Supplier: Foxlink / Cheng Uei Precision Industry Co., Ltd.**

**Test Sample status: DVT EDA**

**Revision History:**

Item	Date	Revision	Description of Change	Edited By
1	2011/03/24	1.0	Frist release	Nicole Chang

**Approved:**      **Reviewed:** Vincent Yu      **Reported:** Nicole Chang

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## 1 PURPOSE:

To verify if the hard drive metal and IC have meets the thermal limit requirement.

## 2 TEST SAMPLE/QUANTITY:

Capacity	Phase	EDA S/N	HDD S/N
Barracuda 2TB	DVT_P1-AVL1	2GHP0009	5XW2DQ08
Barracuda 3TB	DVT_P1-AVL1	2GHP001Z	9XK0C7AF
Barracuda 3TB	DVT_P2-AVL2	2GHP004S	9XK0A19R

2.1 Mechanical platform: DVT

## 3 TEST EQUIPMENT:

- 3.1 Temperature & Humidity Chamber: Brand KSON, Model: KTHB-615C-BS or equivalent.
- 3.2 Thermograph & Thermocouple: HP 34970A, Data Acquisition/Switch Unit or equivalent.
- 3.3 Test Program: Mayhem RealWorld 2
- 3.4 Desktop PC: Intel(R) Pentium(R) 4 CPU @2.40GHz, 1,024MB of RAM.

## 4 TEST CONDITION:

- 4.1 Set chamber temperature 40°C run 6 hours.
- 4.2 Using thermograph to record the temperature of hard drive metal, exact location is near the S/N label of metal base on HDD and IC surface for U1 ( GL3310 ) .

## 5 TEST PROCEDURE/SETUP/PHOTO:

- 5.1 Use thermal couple probe to stick on the define location of hard drive metal base and GL3310 IC surface.
- 5.2 The EDA should be flat lay down in chamber.
- 5.3 Setting chamber temperature at 40 degree / 6 hours.
- 5.4 The EDA run Mayhem program at the same time and record the temperature data.



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## 5.5 EDA setup

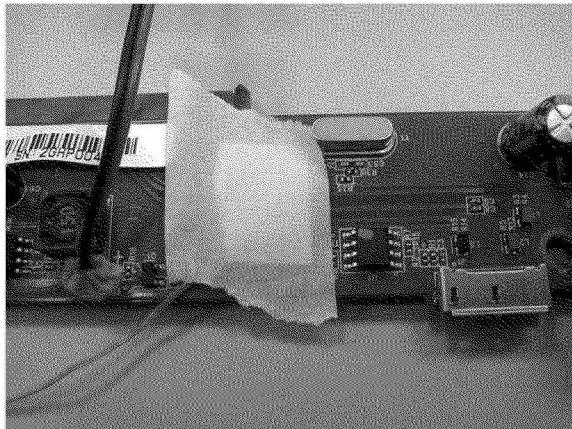


Units in chamber

Adhere the thermocouple to the  
HDD directly



HDD thermal couple location



Bridge IC with thermal couple probe

## 6 PASS/FAIL CRITERIA:

The measured temperature from metal base plate (exact location near the S/N label) of HDD shouldn't exceed specification limit, ie, HD temperature 65°C / IC junction temperature 115°C.



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## **7 TEST DATA/RESULT AND CONCLUSION:**

### 7.1 P1-AVL1 with Barracuda 2TB HDD

◆ Temperature record table

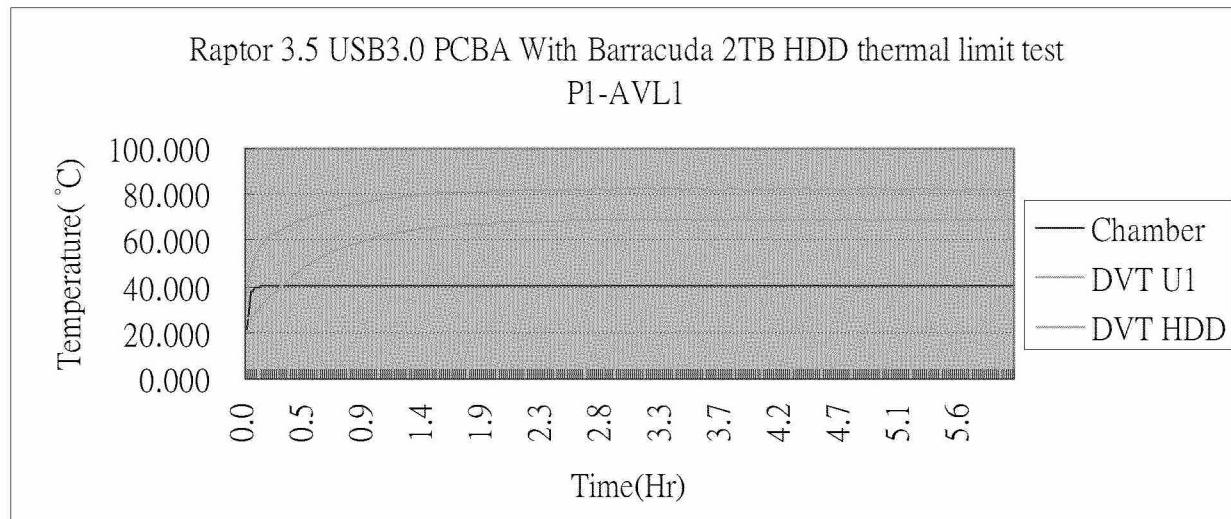
Time Elapse (Minute)	Chamber ( °C)	EDA S/N : 2GHP0009 ; HDD S/N : 5XW2DQ08		
		Specification limit : HD temperature : 65°C ; IC junction temperature 115°C		
		GL3310 U1 Junction ( °C)	Margin (%)	HDD ( °C)
10	40	64.12	38.58	39.24
30	40	70.41	33.11	49.89
40	40	74.54	29.52	56.76
60	40	77.24	27.17	61.20
70	40	79.20	25.47	64.12
90	40	80.90	23.99	66.03
100	40	80.92	23.97	67.11
120	40	81.72	23.28	67.78
130	40	81.79	23.22	68.34
150	40	82.21	22.85	68.56
160	40	82.53	22.57	68.91
180	40	82.34	22.74	69.03
190	40	82.50	22.60	69.14
210	40	82.37	22.71	69.10
220	40	82.32	22.75	69.05
240	40	82.26	22.80	69.12
250	40	82.34	22.74	69.20
270	40	82.11	22.94	69.25
280	40	82.55	22.55	69.26
300	40	82.25	22.81	69.20
310	40	82.53	22.57	69.18
330	40	82.08	22.96	69.19
340	40	82.20	22.86	69.27
360	40	82.37	22.71	69.30

◆ Temperature profile

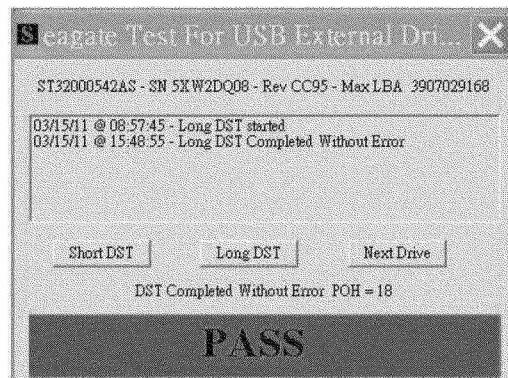


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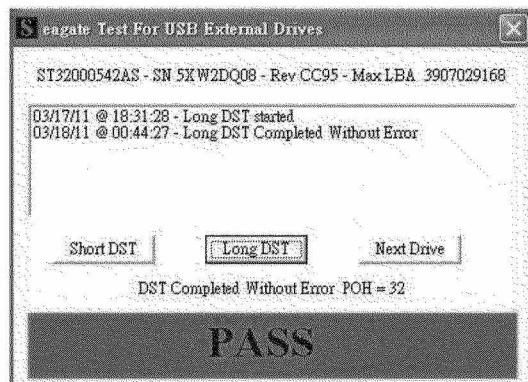
◆ Pre test with Long DST



HDD S/N : 5XW2DQ08

◆ Post test with Long DST

HDD S/N : 5XW2DQ08





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## 7.2 P1-AVL1 with Barracuda 3TB HDD

### ◆ Temperature record table

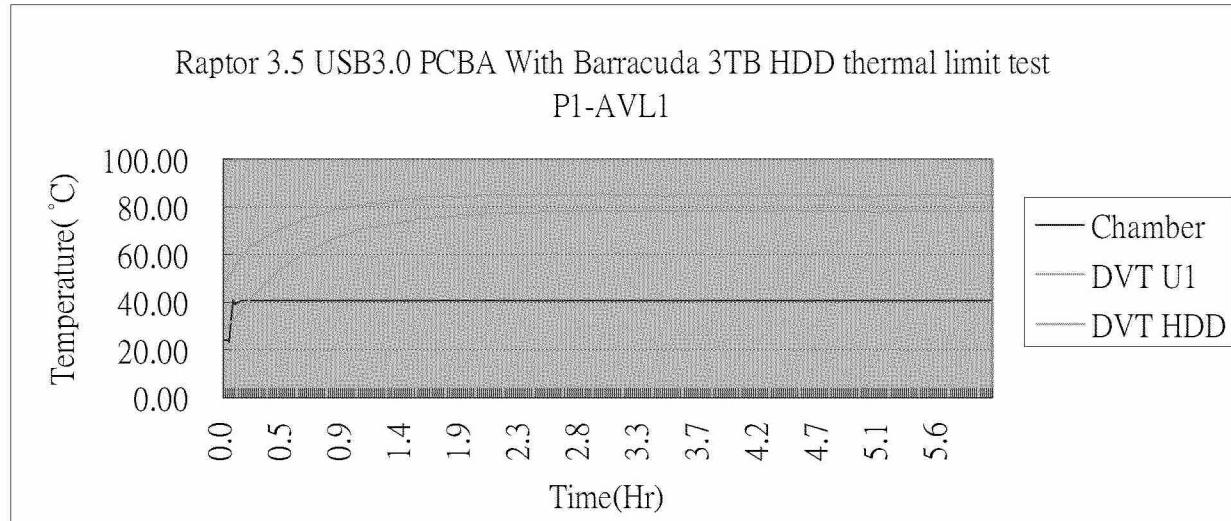
Time Elapse (Minute)	Chamber ( °C )	EDA S/N : 2GHP001Z ; HDD S/N : 9XK0C7AF		
		Specification limit : HD temperature : 65°C ; IC junction temperature 115°C		
		GL3310 U1 Junction ( °C )	Margin (%)	HDD ( °C )
10	40	65.08	37.74	44.04
50	40	72.36	31.41	56.09
40	40	77.01	27.38	64.17
60	40	80.11	24.68	69.34
70	40	82.05	22.99	72.45
80	40	83.66	21.59	74.59
100	40	84.32	21.02	75.92
120	40	85.04	20.39	76.95
130	40	85.26	20.20	77.59
150	40	85.41	20.07	78.01
160	40	84.85	20.56	78.12
180	40	85.51	19.98	78.15
190	40	85.05	20.38	78.02
210	40	84.64	20.74	77.98
220	40	85.19	20.26	78.11
240	40	85.14	20.31	78.29
250	40	85.29	20.18	78.36
270	40	85.32	20.15	78.45
280	40	85.09	20.35	78.15
300	40	84.69	20.70	78.04
310	40	84.83	20.58	78.15
330	40	85.12	20.32	78.20
340	40	84.73	20.66	78.05
350	40	84.84	20.57	78.13

### ◆ Temperature profile

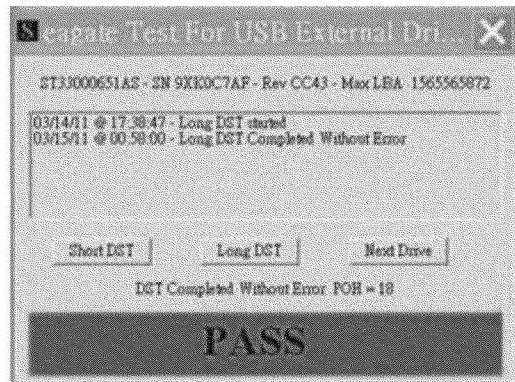


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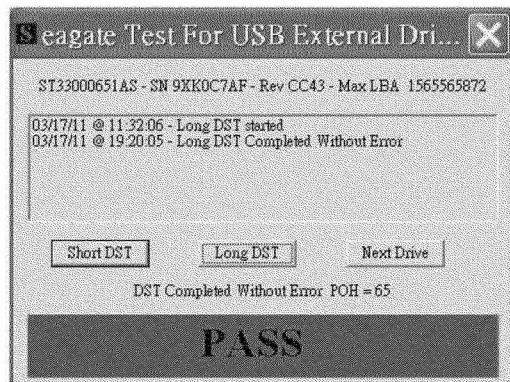
◆ Pre test with Long DST



HDD S/N : 9XK0C7AF

◆ Post test with Long DST

HDD S/N : 9XK0C7AF





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## 7.3 P2-AVL2 with Barracuda 3TB HDD

### ◆ Temperature record table

Time Elapse (Minute)	Chamber ( °C )	EDA S/N : 2GHP004S ; HDD S/N : 9XK0A19R		
		Specification limit : HD temperature : 65°C ; IC junction temperature 115°C		
		GL3310 U1 Junction ( °C )	Margin (%)	HDD ( °C )
10	40	64.16	38.55	41.52
50	40	72.06	31.68	54.76
40	40	77.32	27.10	63.56
60	40	80.70	24.17	69.06
70	40	82.54	22.56	72.56
80	40	83.72	21.54	74.73
100	40	84.98	20.45	76.46
120	40	85.92	19.62	77.42
130	40	86.06	19.50	78.12
150	40	86.53	19.10	78.73
160	40	86.88	18.79	78.90
180	40	86.51	19.11	78.99
190	40	86.74	18.92	79.05
210	40	86.71	18.94	79.31
220	40	87.15	18.56	79.49
240	40	86.57	19.06	79.36
250	40	87.13	18.58	79.11
270	40	86.42	19.19	78.68
280	40	86.80	18.86	78.93
300	40	86.60	19.04	78.78
310	40	86.65	18.99	79.01
330	40	86.70	18.95	79.03
340	40	86.86	18.81	79.21
350	40	86.65	18.99	79.02

### ◆ Temperature profile

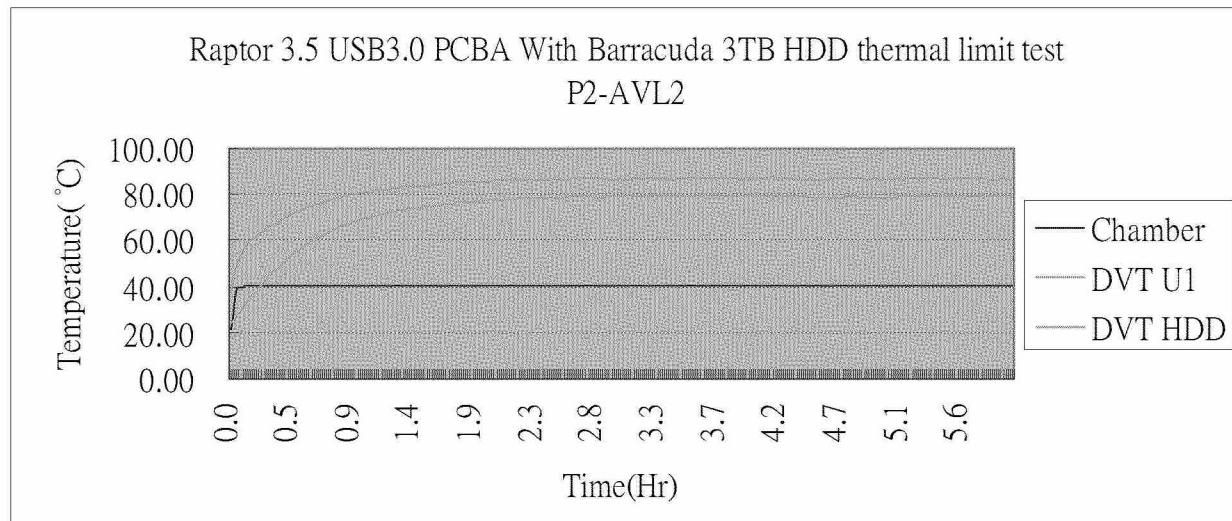


# Cheng Uei Precision Industry Co., Ltd.

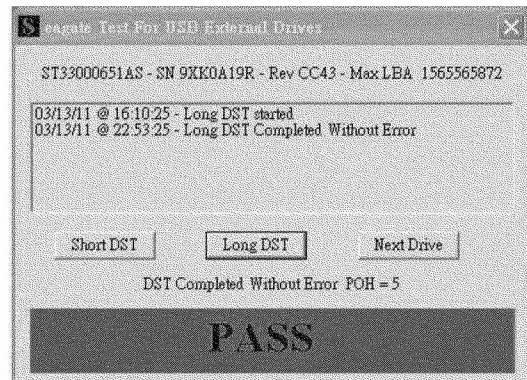
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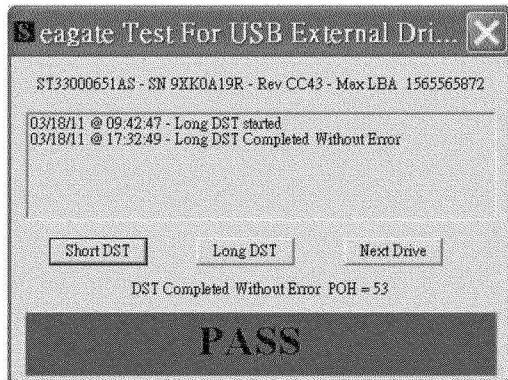
◆ Pre test with Long DST



HDD S/N : 9XK0A19R

◆ Post test with Long DST

HDD S/N : 9XK0A19R





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## **8 TEST DATE AND AMBIENT TEMPERATURE AND HUMIDITY:**

2011/03/16, At Tucheng lab, 20+/-5°C, 40-50 %TH.

## **9 IC Junction temperature calculation:**

◆ Bridge IC GL3310 thermal spec :

Symbol	Parameter	Min	Max	Units
T <sub>j</sub>	Commercial Junction Operating Temperature	0	125	°C

Power : 0.7W

Symbol	Definition	Airflow value(c/w)
θ <sub>JC</sub>	Thermal resistance:junction to case(not air-flow dependent)	9.3

The IC junction temperature can't exceed 115°C (IC spec is 125°C)

Formula : T<sub>j</sub> = T<sub>c</sub>+P\*θ<sub>JC</sub> = 87.13 + 0.7W \* 9.3 = 93.64 °C

T<sub>j</sub> : Junction temperature of IC

P : IC power dissipation

T<sub>c</sub> : max measurement data of IC temperature=87.13°C

Above results , the real junction temperature is 93.64°C and do not exceed 115°C limit.

## **10 Conclusion :**

Fail , HDD's temperature over 65°C limit.